AN APPRAISAL OF THE STATUS AND ECOLOGY OF *GYMNOSOMA NITENS* MEIGEN (DIPTERA: TACHINIDAE) IN BRITAIN AND ITS RELATIONSHIP WITH THE FAUNA OF THE THAMES TERRACE GRASSLANDS OF THE EAST THAMES CORRIDOR

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Abstract. Previously unpublished records of the tachinid fly *Gymnosoma nitens* are detailed and its status and ecology in Britain are discussed in relationship to the fauna of the East Thames Corridor.

INTRODUCTION

Nationally important invertebrate assemblages have been identified in the East Thames Corridor in recent years (e.g. Harvey, 1994; Tattersfield *et al.*, 1996) and there is increasingly recognition of the importance of this invertebrate fauna (Benton 2000; Harvey, 1999; Plant & Harvey, 1997) at a time when there is enormous development threat to most of the sites and habitat mosaic. The short communication by Richard Jones (1999) on recent records of *Gymnosoma nitens* refers to the capture of the fly at Essex sites of the north bank of the Thames. The number of new *Gymnosoma nitens* records in south Essex and north Kent and an association with the East Thames Corridor fauna suggest a full examination of the British distribution is worthwhile.

The first British record of *G. nitens* from Happy Valley near Box Hill, Surrey is given in Clark (1958) and Belshaw (1993). The second, third and fourth published records are described in Plant & Smith (1996). The paper attributes a capture by C. W. Plant on 2.vii.1995 at Richborough Power Station, East Kent as the second British record but details of two more specimens collected at Mill Wood Pit, South Essex have the year of capture transported from 1994 to 1995. The correct details, previously given in Smith (1995), are of one female collected by the present author on 1.viii.1994, with a second female collected by C. W. Plant on 3.viii.1994. Earlier captures at White Downs, Surrey in 1977 (Jones, 1999) and of large numbers at Lydden Hill, East Kent in 1985 (Clemons, 1999a) have subsequently been published.

L. Clemons has also taken the fly in West Kent at Trosley Country Park (TQ6461) on 20.vii.1996 (op cit.) and at Darenth Park (TQ569724) on 26.vii.1998 (Clemons, 1999b). Jones (1999) records a male taken at Woodlands Farm near Bexley (TQ446765). In Essex J. W. Ismay (*pers. comm.*) has collected the fly adjacent to the railway embankment at Chafford Hundred (TQ589785) on the edge of the now destroyed Mill Wood Pit site in July 1996, May 1997, on 22.v.1998 and present but not collected on 18.v.1999. He has also collected one adjacent to Grays Chalk Pit SSSI in another part of the Chafford Hundred area at TQ606793 on 22.vi.1998. C. W. Plant has taken a single male at West Thurrock pulverized fly ash (PFA) lagoons (TQ5876) on 2.ix.1996 (Plant & Harvey 1997), R. G. Payne (*pers. comm.*) has collected one female at Southend Sewage Works (TQ879875) on 4.vi.1997. The present author has also collected *G. nitens* at Southend Sewage Works (TQ879874, South Essex) between 14.v and 17.vi.1998 and at six more sites in the East Thames Corridor: at St Clements Church tract in West Thurrock (TQ592771, South Essex) on 30.iv.1997; at Thamesmead (TQ4681, West Kent) on 19.v.1998; Creekmouth

(TQ455818, South Essex) and the nearby Barking PFA lagoons (TQ4682, South Essex) on 24.vi.1998; near Darenth Wood (TQ5672, West Kent) on 17.v.1999; Northwick, Canvey (TQ7683, South Essex) on 23.viii.1999, 21.vi.2000, 23.vi.2000, 17.vii.2000 and 14.ix.2000. P. J. Hodge (*pers. comm.*) collected the species at Littlebrook Lakes, Dartford (TQ555761) in West Kent on 21.vii.2000 and G. A. Collins (*pers. comm.*) has collected it in Surrey at Howell Hill, Ewell (TQ239619) on 28.vii.1999 and at Box Hill, Dorking (TQ176521) on 12.v.2000. The distribution map in Fig. 1 summarises the known British data.

Status and ecology

The hosts of the fly in Europe are the pentatomid bug *Sciocoris cursitans* (F.) and the non-British *S. helferi* (Fieber) (Belshaw 1993) although Clark (1958) cites further hosts and Jones (1999) found the closely related *Podops inuncta* (F.) but not *Sciocoris* at the Bexley site. In Britain the Nationally Scarce *Sciocoris cursitans* overwinters as an adult, lays its eggs in the spring, and develops fairly quickly. Since the adults are long-lived, they can be found in any month of the year, but are at their lowest ebb in July, when the adults of the previous year have mostly died off and the next generation has not yet matured (P. Kirby *pers. comm.*). Southwood & Leston (1959) state that *Sciocoris* oviposits in May–June and adults start to mature from early August onwards. The onset of egg-laying probably depends on spring temperatures, and there is variation in the maturing times in the autumn; last-instar nymphs have certainly been seen in mid-September (P. Kirby *pers. comm.*).

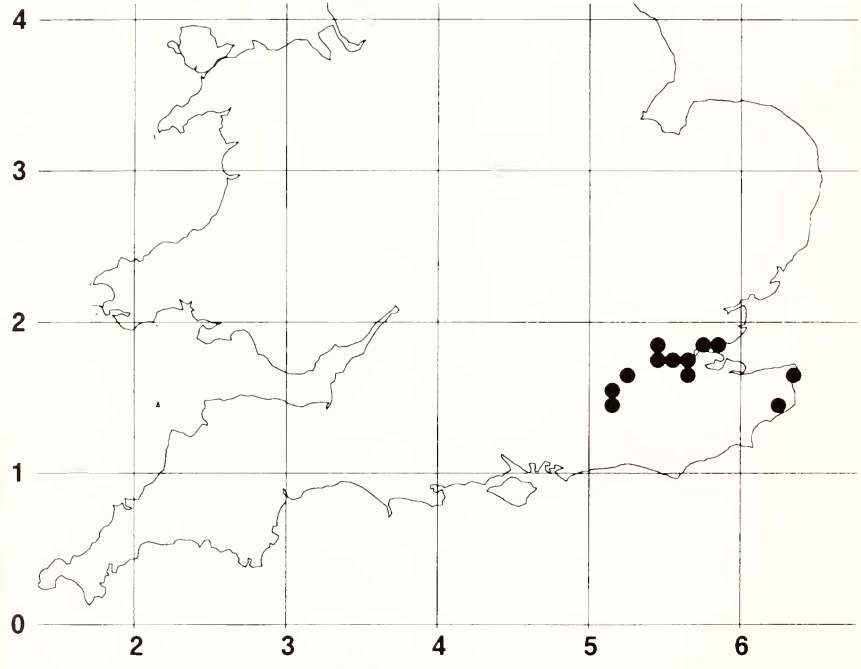

Figure 1. 10 km distribution of *Gymnosoma nitens* in Britain

S. cursitans is especially, but not exclusively, associated with chalk grassland and calcareous sand, and is always found on unshaded, well-drained and friable soils with a rather open vegetation structure and usually with a component of bare ground. Though believed to be phytophagous, there appear to be no certainly identified food plants, and it may be polyphagous.

S. cursitans appears to have two centres of distribution in Britain, in the south-east and the south-west. It is most frequent in Kent, on dunes, downs, and other well-drained soils. In Essex it is known only from the Thames corridor. It is also found on the downs of Surrey and there is a recent record from Thursley NNR (J. Denton, *pers. comm.*). There are a number of records from the dunes and cliffs of Cornwall, but there are otherwise only scattered records from the south-west, extending to Somerset and Hampshire.

A number of localities for *G. nitens* are on chalk. Box Hill and White Downs are both unimproved chalk grassland sites: Lydden Hill is a chalk cutting and Trosley Country Park is in a predominantly calcareous region (Clemons, 1999a); the Darenth Park site consists largely of chalk and flint (Clemons, 1999b); the specimen from near Darenth Wood was swept in rough chalk grassland; at Mill Wood Pit the first two specimens were collected from grassland by the side of a west-facing bank adjacent to an area of sparsely vegetated chalk with developing birch and sallow scrub. Later specimens were collected on a bank adjacent to a railway embankment which consists of short heavily rabbit-grazed grass with some hawthorn scrub (J. W. Ismay, *pers. comm.*). The calcareous nature of the substrate is also evident at most other sites. The specimen from Richborough Power Station was swept from calcareous waste ground contaminated with ash and other material from the power station (Plant & Smith, 1996). At Barking and West Thurrock PFA lagoons the substrate is pulverised fly ash (PFA) over former grazing marsh. As the lagoons have dried out they have developed a flower-rich grassland with many calcicole plants. At Canvey the flies were swept from sparsely vegetated drought-stressed flower-rich grassland, which has developed on a layer of silt covering former grazing marsh. The presence of Southern Marsh Orchid *Dactylorhiza praetermissa* in damper parts of the site together with Bee Orchid *Ophrys apifera* and Pyramidal Orchid *Anacamptis pyramidalis* suggests its calcareous nature. At Creekmouth the specimen was swept from a small area of flower-rich grassland close to the river. This was the worksite for the flood barrier and sea defences construction in the 1970s and early 1980s, and chalk and chalky soil was brought in to landscape the new ground (Curson *et al.*, 1992).

However, at Southend Sewage Works the habitat consists of a south-facing sandy bank and at Thamesmead the specimen was collected from an area of grassland and sparsely vegetated clay with lichen. It is likely that a well-drained warm substrate with sparse open vegetation and much bare ground is just as significant. The single most important habitat feature common to all the East Thames Corridor sites where the author has found *G. nitens* is the presence of unmanaged flower-rich grassland with sparsely vegetated areas developed over many years on the poor substrate. The very dry climate of the region, especially in south Essex and the frequent summer drought curtails the development of extensive scrub and maintains the open areas favoured by warmth loving invertebrates like *Sciocoris cursitans*.

The host bug has been recorded at a number of the *G. nitens* sites and is may well be present at the others. In Surrey *Sciocoris* is recorded from open unimproved chalk downland such as Happy Valley and White Downs where J. Denton has found it common (*pers. comm.*). G. A. Collins (*pers. comm.*) has found *Sciocoris* at several sites on the North Downs, including Box Hill, R. G. Payne (*pers. comm.*) collected

several adults on bare sandy slopes at the Southend Sewage Works site on 27 ix 1996 and 4 vi 1997. The author swept *Sciocoris* with *G. nitens* at St Clements Church tract and has collected it on several occasions at the Canvey site in exactly the same area the *G. nitens* has occurred. On 21.vi.2000, two *Sciocoris* were found here, with one and two eggs, quite possibly of *G. nitens*, attached to their underside exactly as described in Belshaw (1993). In 1985 the author collected *Sciocoris* at Grays Chalk Quarry near the site of J. W. Ismay's collection of *G. nitens* on 22.vi.1998. The author has not attempted to search for the host at the other sites where the fly was collected, although he has recorded *Sciocoris* at several more south Essex locations in 2000.

On a number of occasions *G nitens* has been found in some numbers. Clemons (1999a) encountered the fly in large numbers at Lydden Hill, retaining ten specimens. J. W. Ismay (*pers. comm.*) collected six specimens at the old Mill Wood Pit site in May 1997 and in numbers on 22.vi.1998. On 30.iv.1997 the author swept and collected five males and one female at St Clements Church tract, and further individuals were seen but not retained. A total of one male and seven females were collected between 14.v and 17.vi.1998 in pan traps set on a south-facing sandy bank at Southend Sewage Works (including one male and three females determined by D. A. Smith). At least half a dozen individuals were swept in one small area at Northwick, Canvey on 23.viii.1999 and one male and three females were retained. A male and female were collected at the same site at the late date of 14.ix.2000.

Despite this the fly may have a very localised distribution at a site. At Mill Wood Pit both 1994 specimens were collected on two separate days within yards of each other and the further records by J. W. Ismay have been in the same area despite fieldwork in other parts of the site. At St Clements Church tract all the specimens were swept in one small area of sparsely vegetated ground behind the sea wall. On each occasion at Northwick Canvey all individuals have been swept from one small piece of sparsely vegetated grassland with foliose lichen except a single male collected from carrot flowers nearby. The host bug is often abundant where found but colonies may be of rather limited extent (Kirby, 1992). It would be interesting to find out if the localised presence of *G. nitens* is related to a localised distribution of its host in a locality or to some aspect of behaviour—mating in tachinids often takes place at specific sites where the males assemble; males of many species rest in sunlight on foliage waiting to chase passing females and male swarming behaviour has been observed in several species (Belshaw, 1993).

The unincubated egg is laid on the ventral surface of the (usually adult) host's abdomen and the fly overwinters as a larva within the host. Development times in the Tachinidae vary considerably between species and with temperature, but excluding overwintering the larval and pupal stages both last for 1 to 3 weeks (Belshaw, 1993). Herting (1960) in Belshaw gives the flight period of *G. nitens* in Europe as 2 generations per year—the end of May/June and July to September. The range of dates for British records, between 30 April and 14 September, is interesting and the data now available together with the presence of males in early summer and autumn provide convincing evidence for more than one generation per year in Britain, at least in the climatically favourable East Thames Corridor. P. Kirby has made the suggestion that there may be a series of overlapping generations through the summer, with a low point in the adult population when the adult host bug populations are low in mid-summer. The range of dates over which *G. nitens* adults of both sexes have been captured strongly supports this hypothesis. One of the implications of this would be the vulnerability of *G. nitens* to low population levels of

the host, the critical period being the low point of the adult host. Available numerical data for *G. nitens* are summarised in Fig. 2.

Since the fly overwinters as a larva within the host bug Jones (1999) suggests mild winters ought to occasion low mortality. In wet winters flooding and fungi cause great mortality to hibernating forms of the Pentatomidae (Southwood & Leston, 1959) and the combination of mild winters and very low rainfall probably explain why the East Thames Corridor is the centre for so many records of the fly. However it would be unwise to assume the species has increased recently. There has been relatively little comprehensive survey of invertebrates in the region until the last few years, and the national importance of the invertebrate fauna associated with the special combination of climatic and ecological conditions present in the region has only recently been recognised.

The region has a unique climate in Britain, more continental than the rest of the country. In summer, southern Essex is one of the warmest parts of the country, warmer than Kent, further to the south (Jermyn, 1974). Southeast Essex is the driest part of the country with frequent soil water deficit in the months of May through to August, and in winter the Thames ensures mild temperatures close to the river. The climate is a key factor in the importance of the region. The very low rainfall and the frequent summer drought curtail the development of extensive scrub on poor substrates and maintain over long periods the open areas favoured by warmth loving-invertebrates.

There are also many sites with an extensive mosaic of habitats favouring thermophilic invertebrates at the edge of their range in southern England. The region is now known to have an astonishingly rich invertebrate biodiversity associated with the Thames Terrace sands and gravels which has been acknowledged by English Nature to be of national significance for aculeate Hymenoptera and some Diptera. 74% of the national aculeate fauna has been recorded in the East Thames Corridor, with 96% of the Essex fauna recorded on the Essex side since 1993.

It is unlikely that this biodiversity and the extensive metapopulations of many RDB and Nationally Scarce invertebrate species are a new feature of the region.

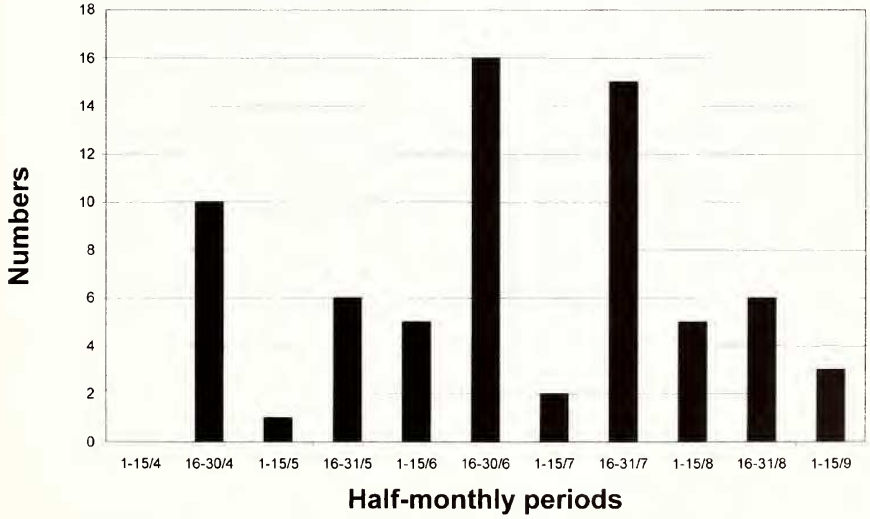

Figure 2. Numbers of *Gymnosoma nitens* plotted against date periods

Indeed there is evidence from work done in north Kent by workers in the past such as H. Elgar, G. E. Frisby and G. Dicker that an important fauna has always been present. Recent longer warmer dry summers may have encouraged an increase in population size and favoured range expansion, but the overall picture is one of a long-standing biodiversity of remarkable wealth and importance.

Unfortunately this wealth and all the brown-field sites are under development threat. Despite its recognised national importance Mill Wood Pit has been lost to housing development, Barking Levels have already been developed for housing and Barking PFA lagoons are being cleared and developed. Thamesmead is an extensive area of habitat with an extremely important invertebrate fauna but it is nearly all lost to retail and associated housing development. Planning permission has been granted for half of the small St Clements Church tract, and the management recommended by ecological consultants on what remains would destroy most of the invertebrate interest. A large part of the Canvey site has outline planning permission for retail development, the site near Darenth Wood is subject to plans for development and none of the (few) remaining sites can be considered safe. Other wildlife areas in the region including nature reserves and country parks are managed more for their flora or for amenity purposes than for their invertebrates. Tree planting is a feature that has become especially prevalent after the gales of 1987 and 1990 but this usually seems to be undertaken without an expert ecological assessment of the existing habitat and will destroy the importance of many invertebrate communities within a few years. There can be little optimism at present for the future of the remarkable biodiversity of the East Thames Corridor.

The status of *Gymnosoma nitens* in Britain is currently Nationally Endangered, RDB1 (Shirt, 1987; Falk, 1991), but evidence now suggests this should be revised. Although it could be argued that a reduction in status to RDB3 or even Nationally Scarce is warranted, the majority of known sites are under immense development threat and Vulnerable (RDB2) would seem to be a more realistic appraisal of the situation.

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SOCIETY NEWS

Collections of T. R. Eagles and E. A. Bowles

In 1971 the Society received the collection of a prominent member, Thomas Rosse Eagles, following his death. This comprised British Lepidoptera and some other orders. Together with this came the collection of his friend E. A. Bowles who had died in 1954. According to the Curator's Report for 1971 (*Proc. Brit. Ent. Nat. Hist. Soc.* **5**: 43) the Bowles collection contained many aberrations of British butterflies and was also rich in Sphingidae and Sesiidae.

There are relatively few specimens bearing these collectors' names in the Society's collections today and most of those found are in the duplicate collection from which specimens are available to members. It is considered likely that most specimens from these collections have been distributed to members in this way as stated for the Eagles collections have been distributed to members in this way as stated for the Eagles collection in the Curator's Report for 1973 (*Proc. Brit. Ent. Nat. Hist. Soc.* **7**: 55).

A friend of Mr Eagles has expressed concern about the apparent loss of these collections. I would therefore be grateful if any member who possesses specimens from either collection or knows of their whereabouts could inform me as soon as possible so that confirmation can be given that they exist.

The specimens we have bear labels printed "T. R. Eagles" with hand-written locality details (mostly from the London area) or printed "E. A. Bowles New Forest" without further data.

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